Spring Doctor

The present invention relates to a spring doctor, and more specifically to a doctor, which is used to scrape clean the various rolls of a machine used in the manufacture of paper.

The usual construction and positioning of doctors are such that the doctor blade, which is usually in the order of 75 - 85 mm-long and of the desired width, i.e. essentially the same width as the roll being doctored, rests with a specific force against the surface of the roll and cleans the surface of fibres and other materials adhering to it. Though the angle of contact of the blade relative to the surface of the roll is often in the order of 25 degrees when the blade is new, the angle of contact changes as the blade wears, so that the angle can be in the order of 35 degrees before the blade is replaced with a new one.

Before replacement, the length of present doctor blades is about 60 mm. Wear causes the surface pressure of the blade to change according to it. In practice, it has also been noted that when using existing types of blade construction there is very little possibility to increase the wear margin/length of the blade, as this will lead to problems arising from the deflection of the blade. Similar problems also arise if the pressure of the blade is increased, when the point of the blade will open and will no longer closely follow the surface of the roll. This results in a poorer doctoring result.

The deficiencies of blades according to the prior art also lead to various compromises being made in the manufacture of blades, the avoidance of which would improve the quality of the blades being manufactured.

Doctor blades are changed in paper machines at approximately weekly intervals. The change as such is not a difficult operation, but it is expensive, as it takes about one hour and costs can easily rise to about € 20 000. Thus, a lengthening of the interval between changes would easily have even considerable financial effects in the manufacture of paper.

The present invention is intended to create a new, improved doctor-blade construction, with the aid of which the drawbacks besetting the prior art can be avoided and savings will become possible in the manufacture of paper.

These and other benefits and advantages of the invention are achieved in the manner stated to be characteristic in the accompanying Claims.

In the following, the invention is examined in greater detail with reference to the accompanying schematic drawings, which show one embodiment according to the invention. Thus

Figure 1 shows one blade carrier, blade holder, and blade according to the invention, when the blade is at its full size, and

Figure 2 shows the same construction in a situation, in which the blade has worn more or less to a state in which it must be replaced.

The roll, the surface of which is cleaned by the doctor blade, in marked in the figures with the reference number 2. As can be seen, the present case concerns a roll 2 with a relatively large diameter, the surface of which is only slightly curved in the figures.

The blade holder 1 has a more or less conventional construction. It is formed of a frame structure, which is permanently attached, for example, to the frame structure of the paper machine. The frame 5 of the blade holder 1 has a lug 3 for a shaft 4. The blade holder 1 is pivoted around the shaft 4, allowing the blade holder to be rotated to a limited extent around the shaft 4 according to the control. The control is, in turn, provided by using hose-like components 6 and 7, filled with a pressure medium, which act on the blade holder to rotate it in different directions, as they are located on different sides of the pivot. The hoses 6 and 7 are supported between the body 5 and a suitable surface of the blade holder.

It should be noted that there are numerous different models of known blade holders on the market. The invention is thus not limited to the blade holder shown by way of example.

The actual doctor blade 8 is attached and suitable supported on the side of the blade holder 1 facing the roll. The attachment is made in a conventional manner, with the aid of a loading plate 9 and a counter-plate 10.

The blade construction 11 according to the prior art is shown by a broken line in Figure 1. In practice, this means that the doctor blade 11 is shorter than the blade according to the invention. The blade according to the prior art is also of a straight construction.

Instead of using a straight construction, the blade construction 8 according to the invention is made to be curved, which also means that the construction is made sturdy, compared to the doctor blade according to the prior art. Thanks to the non-buckling and essentially non-deflecting construction achieved, the doctor blade can be made clearly longer than a blade according to the prior art, which in turn means that replacement will be needed much less frequently than when using a traditional doctor blade. The savings will be considerable.

The construction according to the invention also achieves another advantage, which is that, by curving the doctor blade 8 as shown, and bending it slightly upwards, as shown by the reference number 12, the angle of the blade relative to the surface 2 of the roll can be made to remain nearly constant over the entire operating life of the blade. This also brings savings, as separate measures are not required to adjust the angle. Similarly, the doctoring situation remains constant for the entire operating life of the doctor, because the angle, the contact surface, and the pressure will not change.

A protector plate suitable for the purpose can be attached behind the blade and will prevent dirt that may accumulate on the back of the blade from entering the blade holder. Figure 1 shows an example of such a protector plate, marked with

the reference number 13. In particular, cleanliness is an extremely important factor in the inside of a hose-loaded holder. If solid dirt gets between the loading hose and the loading plate, it will cause a deviation in the loading profile of the blade. This will lead to uneven blade wear, a reduction in doctoring effect, possible entry of dirt into the paper, a deterioration in the moisture profile of the paper and, at the very least, a reduction in the production efficiency of the paper machine, due to web breaks.

As stated above, the improvements in the doctor blade according to the invention bring considerable savings, because the use of this construction minimizes the operations that cause detriments to production. The increases in the manufacture of the actual blade, and in the subsequent costs are only very small.

The invention is described above with reference to only one well regarded embodiment, which must be considered as in no way restricting the invention.

Thus, the blade according to the invention shown in the figures can be adapted in many ways. For example, instead of the blade being curved over its entire length, it can also be made as a combination with a curved portion and also a straight portion. A blade curved in two directions is also possible. The radius of the curve can also be changed as desired over the length of the blade. It may also be sensible to make the blade with a varying thickness. Such an alternative, in which the blade thins towards its point may be particularly suitable.

Blades like that shown are usually manufactured from a composite material, which, in other words, is usually formed of a plastic-based matrix, to which reinforcement is added. The reinforcement is normally of a fibrous material; aramid fibres, carbon fibres, kevlar, or similar. The invention also permits the desired elasticity properties and stiffness to be achieved by altering the amount and orientation of the reinforcement. In other words, if desired, the properties can be altered by arranging more fibres in one part of the blade than in another,

while similarly the fibres can be oriented in one direction or another in specific parts of the blade.

The shape and construction of the blade holder shown in the figures by way of example can differ even greatly from the model shown. The invention is in no way restricted to the solution shown. It is also self-evident that the pressure, exerted by the blade on the roll being doctored, can by created in any way at all. The means for creating the pressure need be in no way connected to the blade holder. For example, the pressure can be regulated by a microprocessor and be variable for the entire duration of the operation.